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NOTE.—Recent publications of the United States Public Health Service relative to this study of industrial morbidity are as follows:

(1) Sickness Records for Industrial Establishments, Reprint No. 573.
(2) Keeping Tab on Sickness in the Plant, Reprint No. 589.
(3) Sickness and Absenteeism during 1919 in a Large Industrial Establishment, Reprint No. 611.
(4) Sickness Frequency Among Industrial Employees, Reprint No. 624.
(5) Diseases Prevalent Among Steel Workers in a Pennsylvania City, Reprint No. 632.

THE FATE OF THE FIRST MOLAR.

By HARRY B. BUTLER, Director of Mouth Hygiene Unit No. 1, United States Public Health Service.

No close observer of human dentition can fail to be impressed with the part in human economy played by the first, or, as it is often called, the 6-year molar. This particular tooth differs from the others in many points. Not only is this the first of the permanent teeth to make its appearance, but it is the largest of the teeth. It differs from those that have thus far appeared in that it is not replaced by any other tooth and it does not replace another. However, this tooth is to play a very important part in dentition, as it must sustain the stress of mastication during the period in which the temporary teeth are being replaced by the permanent teeth, and it also largely determines the position of the permanent teeth which follow it in normal dentition.

The first or 6-year molar has developed under somewhat different conditions from those of any that have appeared before it, and it is to be subjected to a different environment. Considering the part it should play in years to follow, its loss can be regarded as nothing short of a calamity; yet, as proved by statistics, we find it to be the tooth most frequently carious, the one most neglected, and the one most frequently lost.

A somewhat exhaustive study has been made of this first molar by the field unit of the United States Public Health Service, and many interesting facts have been revealed. In this study some 6,388 mouths were examined. These were about equally divided between the sexes, 3,232 being males and 3,156 females. In age these children ranged from 6 years, or the year of the first molar's appearance, to 17. In other words, the first 10 years of the life of this molar have been considered.

During the first year after the eruption of the first molar, caries is found to be frequently invading it. We found this condition progressing in 4.8 per cent of all the first molars in the 6-year-old children examined. This means 4.8 per cent of *all* the first molars. The percentage of children having one or more carious first molars at this age was 14.3 per cent. The difference shown between the sexes at this age gives a slightly better condition for boys, the exact percentages of caries being 16.1 among the girls and 12.5 among the boys, an advantage which does not appear at some subsequent ages. It is interesting to note that the largest percentage of carious first molars among boys occurs at the age of 10 years, the same condition occurring among the girls at the age of 9. (None of these figures shows any relation to such molars as have been lost or subjected to any reparative procedures.)

These figures certainly furnish food for thought if, indeed, they are not to be considered alarming. With this percentage carious during the first year of the existence of this tooth, fully erupted, it must be admitted that here we have one of dentistry's greatest problems. Compared with the time and thought devoted to operative work, preventive dentistry may be said to have received no attention whatever.

What becomes of this tooth which shows carious areas at so early a period? At the age of 11, or five years after its eruption, 9 per cent have been extracted or appear as necrosed roots only. Fifty-four and one-half per cent of the children examined at this age showed one or more of these teeth missing or defective, regardless of such cases as had received professional aid.

Let us look at this tooth after another five years. We now find dentistry meeting the situation to a more satisfactory degree, and there is shown an increase in the percentage of lost or hopeless of but 4.7 per cent.

In order that there might be a better understanding of existing conditions regarding caries of this tooth, 1,000 cavities were carefully plotted as to location. It had been thought that its environment might have much to do with the loss of this tooth. For this reason the 1,000 cases were selected as to age, and only children from 9 to 12 were considered for the reason that during this period this molar would have no tooth contiguous to it upon the distal surface, while upon the mesial surface it would be adjacent to a temporary tooth, in many cases carious. The following findings were thus obtained.

Occlusal cavities	877
Mesial cavities	110
Distal cavities	8
Buccal cavities	3
Lingual cavities	2
	1,000

That so large a proportion of cases exist in which caries attacked the occlusal surface of this tooth, and at so early a period of the tooth's erupted existence, leaves but one cause to be ascribed, namely, faulty development. This is found to be of somewhat different character in the varied cases.

In some cases there seems to have been a faulty or incomplete calcification of the enamel at the sulcus, with a rapid onset of caries following. In other cases we find that the enamel formation has been arrested, with little if any deposit of this protecting tissue at this point, and first indications of caries have been noted before the tooth was fully erupted.

Another form of faulty enamel has been observed, and this not infrequently. A tooth may be considered as composed of one or more lobes, with the enamel formation first appearing at the incisal edge or at the cusp tips. In multicusped or multilobed teeth, like a molar or bicuspid, the enamel formation, starting at two or more points, progresses until the advancing areas of formation merge one into another. Whenever these advancing areas merge upon a convex surface, definite union occurs. However, this formation in many cases appears to have developed in each lobe of these teeth separately as though no other lobe existed. Here it may be seen that the enamel has been deposited upon the various lobes as upon the anterior teeth, with the enamel rods tending to assume position perpendicular to the areas of the dentine which they are to cover. A glance at Figures 1 and 2 will reveal the result when, thus developing, two of these areas arrive in their development simultaneously at a sulcus.[1] Here we find at times that the relative position of the enamel rods as they join each other is quite different from the relation of those where the approaching areas have met upon a convex surface. Here the interprismatic binding substance, or cementum, fails to produce definite union between the ends of these rods as it does when they approximate each other along the line of their main axes, and a faulty union between the merging areas results.

With any of these types of faulty development present and with the sulci forming favorable locations for the retention of food débris, and because of the increased colonies of bacteria here located, owing to lack of abrasion in the process of mastication, caries rapidly develops. This is also noticed in the smaller sulci upon lingual and buccal surfaces, but in correspondingly less degree, as evidenced by the findings of but five cases in 1,000 of these two areas combined, as compared with 877 found in the occlusal sulci. (The frequent appearance of caries as a result of faulty development at these points may be viewed as a process of involution which human teeth are undergoing, as modern food and culinary methods render their use less essential.)

While the teeth of children with marked malnutrition show a large percentage of caries, these occlusal cavities appear in the teeth of

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[1] See also cut facing p. 90, "Pathology of the Soft Tissues of the Teeth," by G. V. Black

Public Health Reports, Vol. 36, No. 9, March 4, 1921.

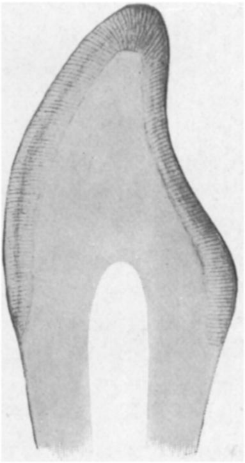

Fig. 1.

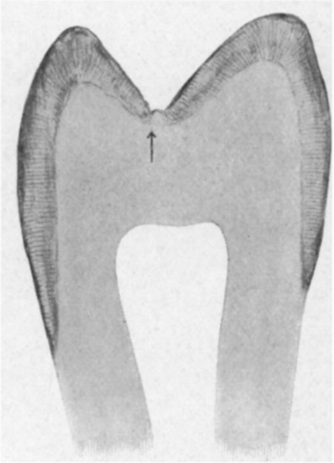

Fig. 2.

children of vigorous health as well as in those of the undernourished. This dental defect is also noted in bicuspids and other molars, but it is in the first molar that it is most conspicuously noted.

Among the common direct causes of dental decay there should be recorded an inherited tendency to dental caries. Also we find faulty diet and lack of rational mouth toilet frequent factors. These factors being true in all cases of caries, must of necessity apply also to the first molar.

It will appear that to undertake any preventive measures toward the improvement in condition of the first molar means measures that will successfully combat the process of involution, which all authorities agree that the human tooth is undergoing. This would seem a hopeless task, necessitating the eating of coarser food and more vigorous use of the teeth generally.

Certain general measures should be adopted. As early as the tenth week of fetal life the development of the dental organs may be found, and a well-balanced diet for the mother will be as beneficial to the teeth as it will to the development of other calcific tissues; and the same will hold true regarding the diet of the child during its first years. Prophylaxis is of especial value to the younger children; but it is evident that in some corrective measure lies the chief hope for a long period of usefulness in the case of the first molar.

It is found that the greatest number of first molars are lost from one of two causes—either the parent fails to recognize this important tooth as a permanent tooth, or else the fear of the dental chair upon the part of the child is such that any early treatment will not be obtained. To obviate the former condition, educational measures are clearly indicated; and in the matter of fear of the dentist, much may be done.

There is no single point in which dentistry falls so short of the mark as in the successful treatment of the temporary tooth; and the fact that it will be eventually replaced by another tooth seems to many dentists to justify its total neglect. Much advancement in dental science must come, and with this, early visits to the dentist by these little citizens. By careful treatment, confidence in the operator must be obtained and fear must be dissipated. Then, with these early visits, the first signs of caries in the first molar may be detected; and only by most painstaking operative procedures may this tooth be preserved for the required years of usefulness.